EPA Climate and Waste Program

Presentation Overview

- Introduction
  - What is climate change?
  - Environmental impacts of climate change
  - Waste sector emissions
  - Linkages between waste management practices and GHG emission reductions
- Climate and Waste Program
  - Research and technical assistance
  - Program implementation
  - Education and outreach
- Summary

What is Climate Change?

- "A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods." *United Nations Framework Convention on Climate Change*

Environmental Impacts of Climate Change

- Health Impacts
- Agriculture Impacts
- Forest Impacts
- Water Resource Impacts
- Impacts on Coastal Areas

For more information:

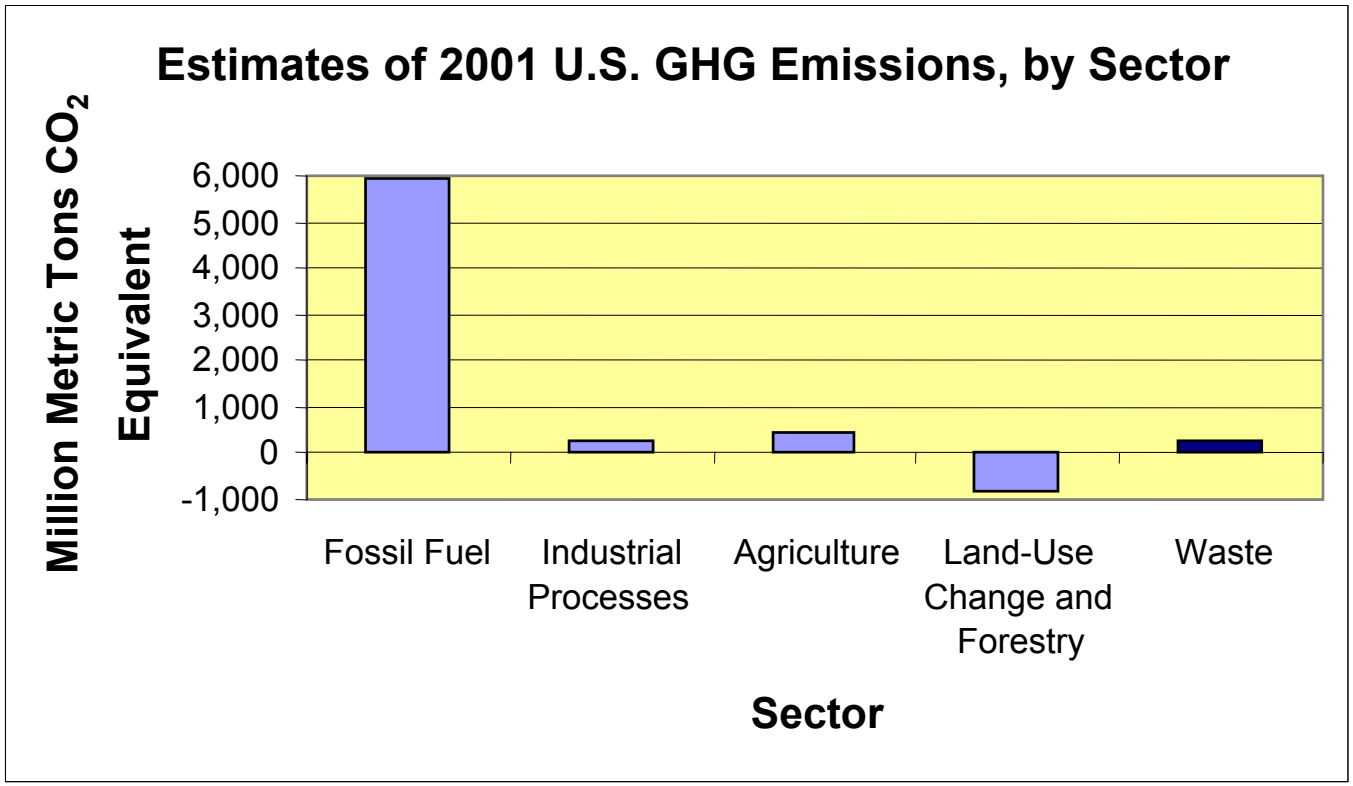
www.epa.gov/globalwarming/impacts/index.html

Waste Sector Emissions

- Landfills
  - Methane is produced, but can be flared or recovered for energy
  - Some of the carbon in materials that are landfilled is stored long term
- Combustion
  - Carbon dioxide and nitrous oxide are emitted
- Wastewater Treatment
  - Methane and nitrous oxide are emitted

Waste Sector Emissions (cont.)

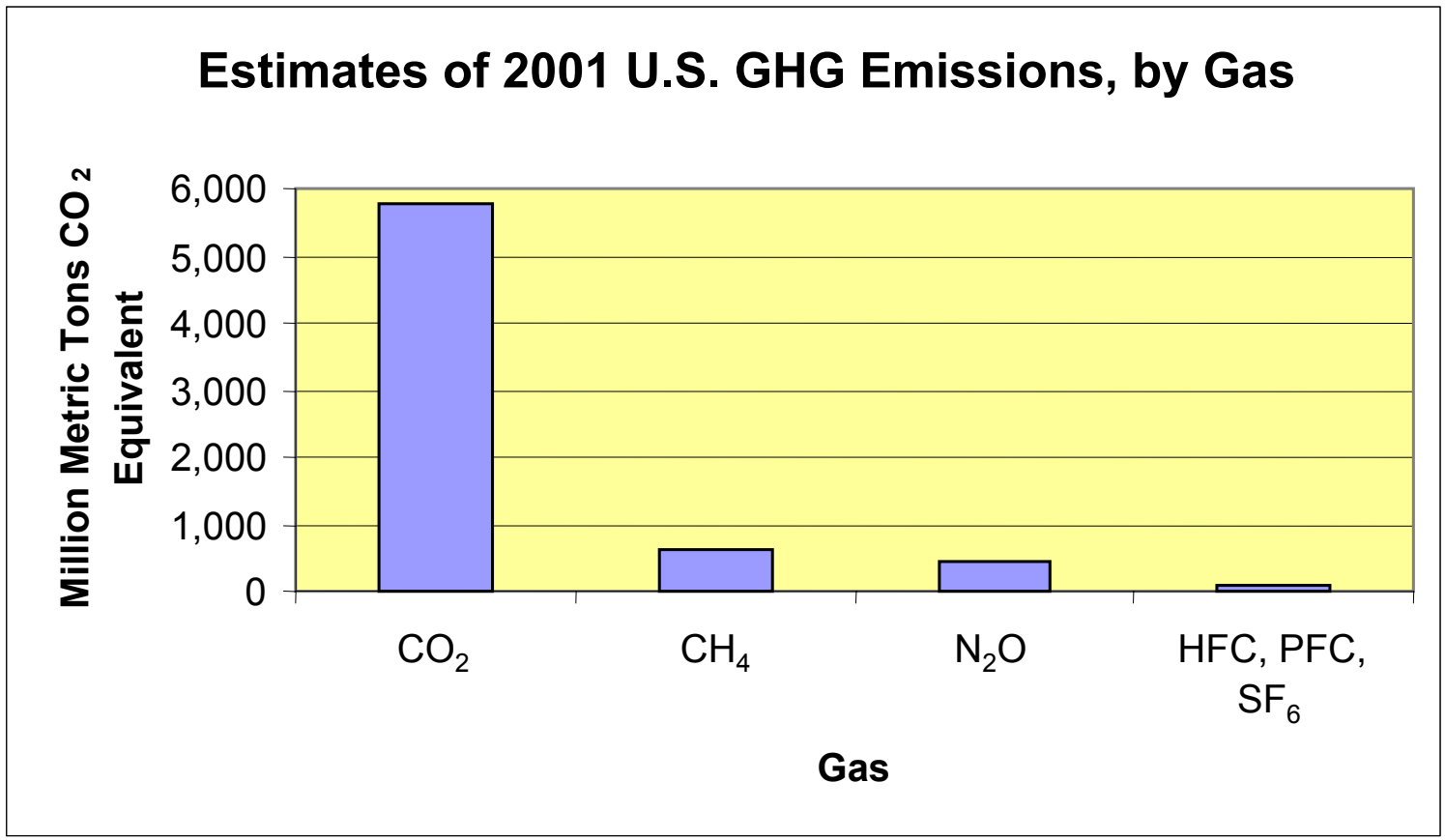
2001 Emissions by Sector



- In 2001, the waste sector accounted for nearly 4% of net GHG emissions.

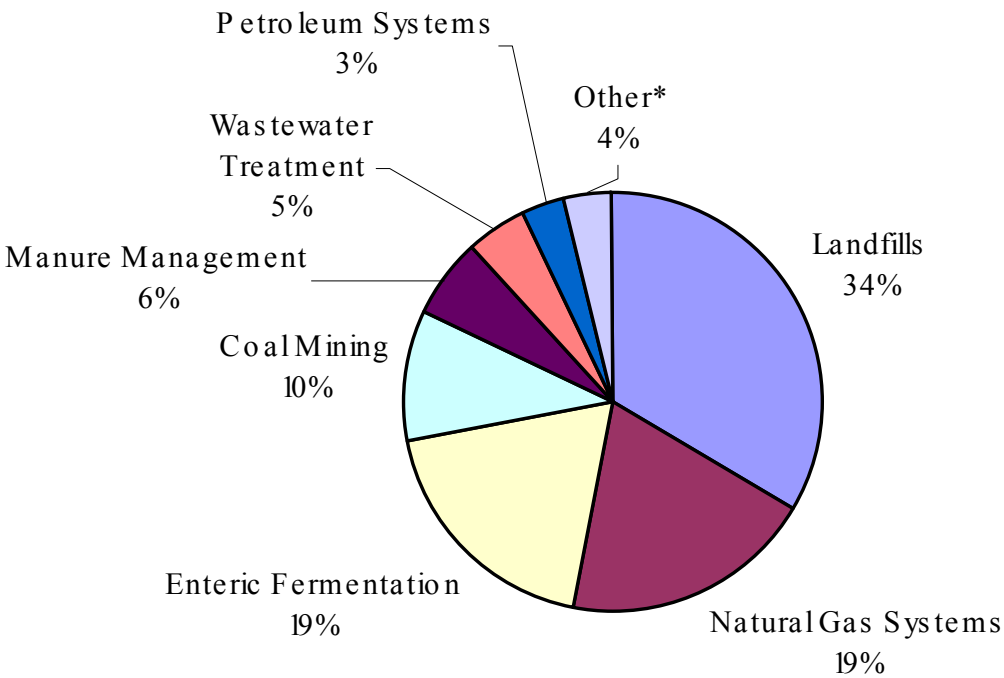
Waste Sector Emissions (cont.)

2001 Emissions by Gas



Waste Sector Emissions (cont.)

2001 CH_4 Emissions by Source



**Other includes: Rice Cultivation, Stationary Combustions, Mobile Combustion, Petrochemicals, and Agricultural Residue Burning.*

- Landfills are the largest anthropogenic source of CH_4 emissions in the US, accounting for 34 percent of total CH_4 emissions.

Linkages: Waste Management and GHG Reductions

- "Upstream" links
  - Energy CO_2 emissions avoided through source reduction & recycling
  - Forest carbon storage increases when wood products are source reduced & recycled
  - Carbon storage increases when organics are composted and added to soil
- "Downstream" links
  - Landfill CH_4 emissions avoided through source reduction & recycling
  - Combustion CO_2 emissions avoided through source reduction & recycling

Linkages: Waste Management and GHG Reductions (cont.)

- Waste is a small, but important, source
- Waste sector activities have great GHG emission-reduction potential
  - Climate and Waste Program activities have reduced cross-sectoral emissions
    - 42 million $MTCO_2$ Eq. (1996-2001 actions)
    - 9.6 million $MTCO_2$ Eq. (2001 reductions only)
  - Projected benefits of national recycling
    - Increasing from 30 to 35% recycling = 36.7 million $MTCO_2$ Eq.

Program Overview

- UNFCCC signed in 1992
- Climate Change Action Plan
  - Listed waste reduction as #16 out of roughly 50 U.S. initiatives to reduce GHG emissions
  - Program initiated in response
- Objective: identify and address linkages between waste reduction and climate protection and meet CCAP emission reduction target

Program Components

- Research and technical assistance
  - Conduct life-cycle analyses of waste management options and their impacts on GHG emissions; assist stakeholders
- National program implementation
  - Implement programs to reduce GHG impacts from the waste sector
- Outreach and education
  - Develop and distribute materials on climate change and waste management

Research and Technical Assistance

Purpose

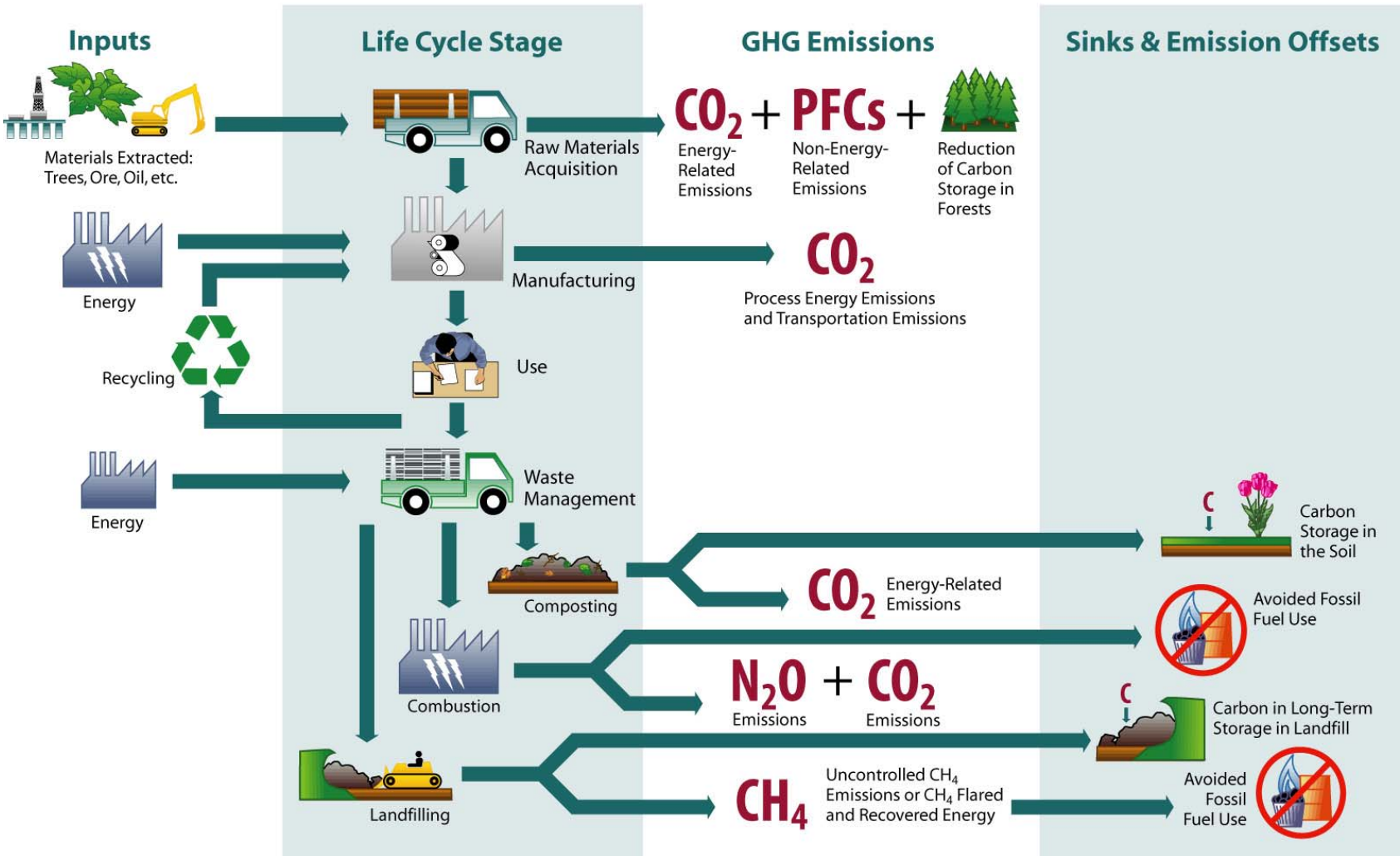
- Provide scientific basis for estimating GHG emission reduction benefits of waste management
- Target materials and management methods with large emission reduction potential
- Provide technical support to stakeholders

Approach

- Incorporate the full range of GHG effects through a material's life cycle
- Use IPCC accounting methods for GHG emissions and sinks
  - Global Warming Potentials (GWPs)
  - Carbon cycling in forests
  - CO_2 emissions from combustion

Research and Technical Assistance

Life-Cycle Analysis of GHG Emissions



Research and Technical Assistance

GHG Emission Factors

Sample Emissions Factors ($MTCO_2$ Eq./ton)

Material	Recycling	Landfilling
Newspaper	-3.48	-0.76
Office Paper	-2.48	2.28
Aluminum Cans	-14.70	0.04
Steel Cans	-1.79	0.04
HDPE	-1.40	0.04
Dimensional Lumber	-2.45	-0.38

- Sum of emissions and sinks throughout the material life cycle
- Expressed in units of metric tons of carbon dioxide equivalent per ton of material

Research and Technical Assistance

GHG Emission Factors (cont.)

- Emission factors developed for:
  - Source reduction, recycling, composting, combustion, and landfilling
  - 19 material types and 6 categories of mixed materials (paper, metals, plastics, organics, MSW, and recyclables); 5 more underway

- Aluminum Cans
- Branches
- Corrugated Cardboard
- Dimensional Lumber
- Food Scraps
- Glass
- Grass
- HDPE
- LDPE
- Leaves
- Magazines
- Medium Density Fiberboard
- Newspaper
- Office Paper
- PET
- Phonebooks
- Steel Cans
- Textbooks
- Yard Trimmings
- Under Development:
  - ✓ Brick
  - ✓ Carpet
  - ✓ Concrete
  - ✓ Fly Ash
  - ✓ Personal Computers

GHG Emission Factors (cont.)

- Applications
  - Understanding GHG impacts of waste management decisions
  - Quantifying life-cycle GHG reductions for voluntary reporting
  - Widening the scope of environmental benefits associated with integrated waste management practices.

Sample Calculation of Benefits

- GHG impact of recycling, rather than landfilling, 10 tons of office paper
  - Baseline: 10 tons x 2.28 $MTCO_2$ Eq./ton= 22.8 $MTCO_2$ Eq.
  - Alternative: 10 tons x –2.48 $MTCO_2$ Eq./ton= -24.8 $MTCO_2$ Eq.
  - Net change: -24.8 $MTCO_2$ Eq. - (22.8 $MTCO_2$ Eq.)= -47.6 $MTCO_2$ Eq.

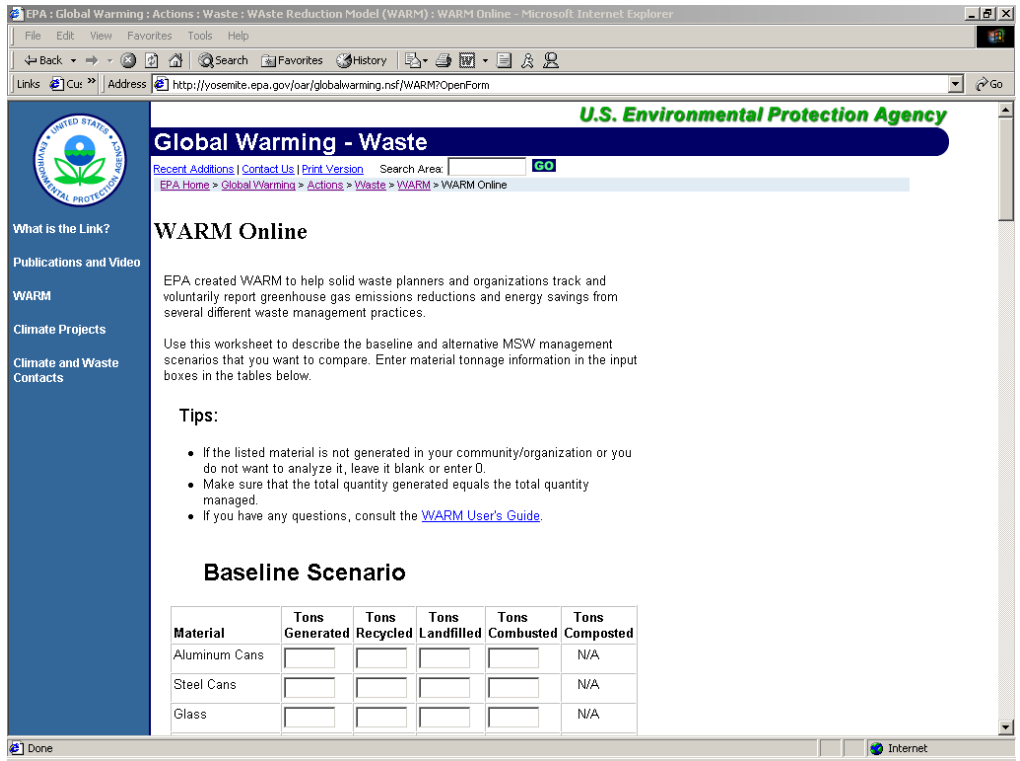
Sample Calculation of Benefits

- GHG impact of recycling, rather than incinerating, 10 tons of office paper
  - Baseline: 10 tons x -0.65 $MTCO_2Eq./ton$= -6.5 $MTCO_2$ Eq.
  - Alternative: 10 tons x –2.48 $MTCO_2$ Eq./ton= -24.8 $MTCO_2$ Eq.
  - Net change: -24.8 $MTCO_2$ Eq. - (-6.5 $MTCO_2$ Eq.)= -18.3 $MTCO_2$ Eq.

Research and Technical Assistance

WAste Reduction Model (WARM)

- Tool to assess GHG impacts of waste reduction activities
- Designed to accept user-specific inputs and provide individualized results
- Available online
  - yosemite.epa.gov/oar/globalwarming.nsf/content/ActionsWasteWARM.html



Research and Technical Assistance

Domestic Stakeholder Assistance

- State Action Plans
  - Delaware
  - Iowa
  - Minnesota
  - Montana
  - New Jersey
- Local Action Plans
  - International Council for Local Environmental Initiatives (ICLEI) - Cities for Climate Protection

Domestic Stakeholder Assistance (cont.)

- Technical Analyses
  - Integrated Waste Services Association
  - U.S. Department of Energy's 1605b Program
  - New Jersey Department of Environmental Protection
  - Recycled Paper Trade Association
  - National Resources Defense Council
  - Northeast Recycling Council
  - Climate Neutral Network
  - ICLEI Cities for Climate Protection
  - World Resources Institute

Domestic Stakeholder Assistance (cont.)

- Outreach Support
  - Air and Waste Management Association
  - American Forest and Paper Association
  - American Plastics Council
  - Greater Philadelphia Commercial Recycling Council
  - Landfill Methane Outreach Program
  - Michigan Recycling Coalition
  - National Association of Counties
  - National Recycling Coalition
  - New York SWANA
  - Solid Waste Association of North America

Research and Technical Assistance

Stakeholder Assistance (cont.)

- International
  - China
  - Canada
  - France
  - Taiwan
  - OECD Working Groups on Extended Producer Responsibility and Waste Minimization

Research and Technical Assistance

Looking Forward…

- Finalize new GHG emission factors
  - Carpet
  - Personal computers
  - Brick
  - Concrete
  - Fly ash
- Release new Manufacturing and Purchasing Greenhouse Gas (MAP-GHG) tool

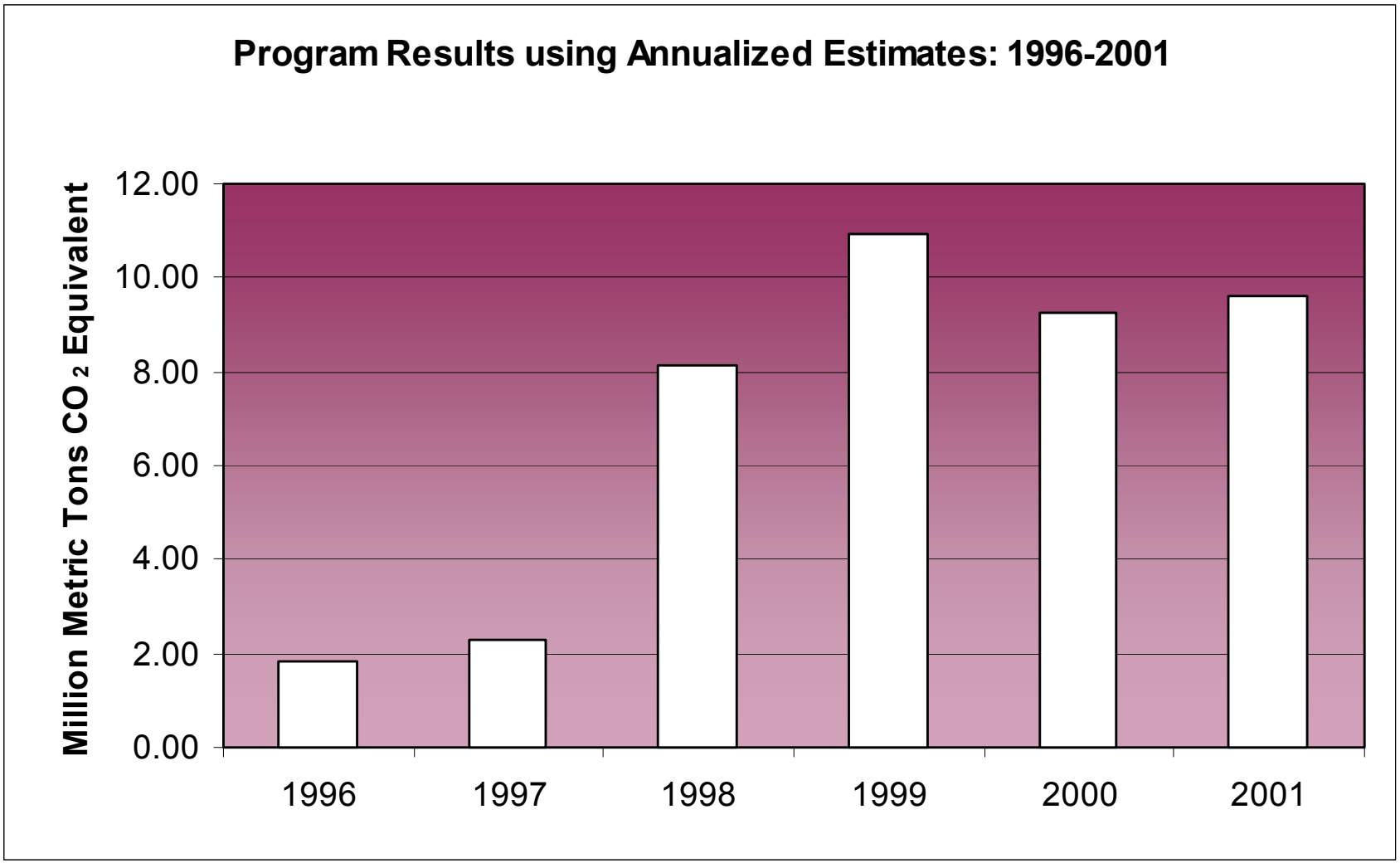
Program Implementation

Purpose

- Achieve the Climate and Waste Program reduction goal of 20.5 million $MTCO_2$ Eq. by 2012
- Demonstrate the linkages between GHG emission reductions and waste reduction activities

Program Implementation

Climate and Waste Results



Program Implementation
Suite of Programs

- Established programs
  - WasteWise
  - Pay-As-You-Throw (PAYT)
- Resource Conservation Challenge Initiatives

Program Implementation

WasteWise

www.epa.gov/epaoswer/non-hw/reduce/wstewise/index.htm

- Encourages cost-effective actions to reduce solid waste
- Voluntary program: 1,250 partners
  - Businesses
  - Federal, state, local, and tribal governments
  - Institutions
- Partners report accomplishments annually
- Quantifiable results

Program Implementation

Pay-As-You-Throw (PAYT)

www.epa.gov/payt/

- Provide economic incentive for residential waste reduction
  - >5,000 communities
  - ~0.31 $MTCO_2$ Eq. emission reduction per person
- EPA distributes information, provides training and technical assistance

Resource Conservation Challenge

www.epa.gov/epaoswer/osw/conserve/

- Coal fly ash
- Construction and demolition debris
- Personal computers
- Carpets

Resource Conservation Challenge

Fly Ash Recycling

www.epa.gov/epaoswer/osw/conserve/c2p2/

- EPA's The Coal Combustion Products Partnership (C^2P^2) Program is promoting the beneficial use of coal combustion products (with focus on fly ash)
  - Environmental benefits
  - Economic benefits
  - Performance benefits

Resource Conservation Challenge

Demolition Debris

- Interest in reusing and/or recycling C&D debris has grown dramatically in the past few years
- EPA is building partnerships and piloting innovative approaches with sectors that can influence the marketplace

EPA

Resource Conservation Challenge

Carpet Recycling

www.carpetrecovery.org/

- National Agreement on Carpet Recycling (January 2002)
  - National goal to achieve a landfill diversion of 40% by 2012, specific strategies include:
    - Reusing 3 to 5 percent annually by 2012
    - Recycling 20 to 25 percent annually by 2012
    - Using 3 percent of recovered carpet annually as an alternative fuel source and as an additive in cement production
    - Burning 1 percent at waste-to-energy annually by 2012
  - Established the Carpet America Recovery Effort (CARE)

Resource Conservation Challenge

Electronics Recycling

http://www.epa.gov/epaoswer/osw/conserve/plugin/index.htm

- National
  - National Electronics Product Stewardship Initiative (NEPSI) – national collection and financing system
  - Plug into eCycling Campaign (www.plugintorecycling.org)
  - Soliciting partnerships and piloting four regional take-back campaigns
- State, Local, Non-profit
  - More than 25 states pursuing legislation on managing e-waste
  - Electronics Take it Back! Campaign (local government example)
  - Clean Computer Campaign (Silicone Valley Toxics Coalition)

Outreach and Education

Purpose

- Educate and inform stakeholders about linkages between climate change and solid waste
- Provide information and tools to stakeholders
- Publicize magnitude of emission reductions achievable through integrated waste management

Outreach and Education

Outreach Materials

- Website
- *Reusable News* edition on Climate Change and Waste
- Fact sheets
- Brochures
- Reports (e.g., MSW GHG Report)
- Tools (e.g., WAste Reduction Model -WARM)
- Journal articles published and underway (e.g., “Keeping it Cool,” published in *Waste Age 9/01*)

Summary

- There is a strong link between waste reduction and climate protection -- best estimated using life-cycle approach and IPCC methods
- Waste reduction can be a low-cost strategy that broadens national, state, and local GHG mitigation portfolios

Summary (cont.)

- States and local governments can make a difference
  - Develop a GHG action plan that includes waste reduction strategies
  - Collect data that will allow you to quantify and publicize the benefits of waste reduction using WARM or another GHG emission estimation tool
  - Communicate the linkages between waste reduction and GHG emissions to the public

Summary (cont.)

- Waste managers can make a difference
  - Use WARM to evaluate the GHG impacts of various waste management strategies
  - Include GHG impacts of waste management practices in your decisionmaking process
  - Consider adopting PAYT in your community
  - Communicate the linkages between waste reduction and GHG emissions to the public

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